Arsenic Treatment Systems - Design and Operation: Michigan's Approach

EPA Arsenic Workshop

Cincinnati, Ohio

Aug 10-11, 2004

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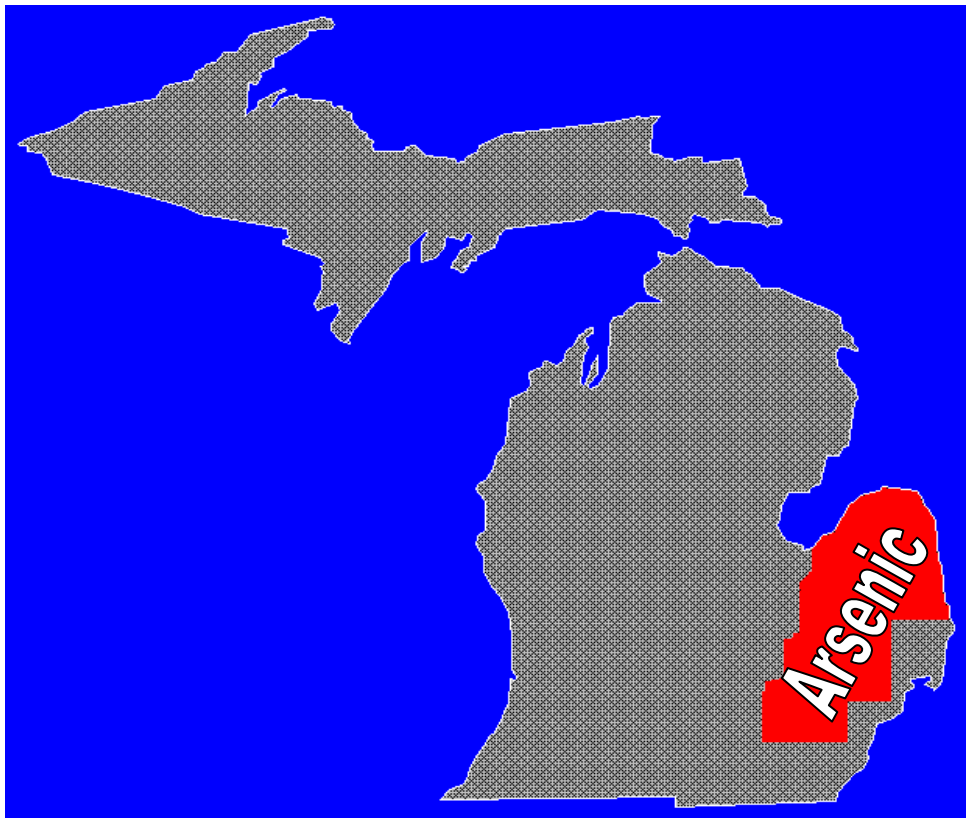
Michigan Water System Inventory

- 1,457 Community (Type 1) water systems
  - 75 surface water sources
  - 278 customers supplies
  - 1,104 ground water sources
- ~10,600 Non-community (Type 2) water systems
  - ~2,600 Non-transient non-community
  - ~8,000 Transient non-community

Arsenic in Michigan

- ~150 community water supplies will exceed the 10 ppb standard
- ~200 non-community non-transient water supplies will exceed the 10 ppb standard
- No surface water sources are expected to exceed the new MCL of 10 ppb

Arsenic in Michigan



Huron
Sanilac
Tuscola
Genesee
Lapeer
Oakland

MI DEQ – Water Division
"Arsenic Policy"

- DEQ – Water Division has created an Arsenic Policy to assist water systems, consulting engineers and manufactures in designing and operating arsenic removal systems.
- Mainly for Type 1 or community water systems

Arsenic Policy

WATER DIVISION
POLICY AND PROCEDURES

NUMBER:	WD-03-020
SUBJECT:	DESIGN AND OPERATIONAL REQUIREMENTS FOR ARSENIC REMOVAL TREATMENT SYSTEMS FOR COMPLIANCE WITH THE ARSENIC MCL
EFFECTIVE DATE:	OCTOBER 20, 2003 PAGE: 1 OF 6

ISSUE:

Effective January 23, 2006, all community water supplies and nontransient noncommunity water supplies must comply with the revised arsenic maximum contaminant level of 0.010 milligrams per liter (mg/l), or 10 parts per billion (ppb). This policy will establish design criteria to be used by water systems when designing, installing, maintaining, and monitoring an effective arsenic removal treatment system.

AUTHORITY:

R 325.10601 (Rule 601) and R 325.10604c (Rule 604c) of the Administrative Rules adopted under the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), covering drinking water standards for specific contaminants, including inorganics, that shall be met by a supplier of water to assure the protection of the public health. In addition, Section 325.1004 (2) of Act 399 states, "Upon receipt of the plans and specifications for a proposed waterworks system, the department shall evaluate the adequacy of the proposed system to protect the public health by supplying water meeting the state drinking water standards."

What is NOT Allowed:

- Point-of-Use (POU) devices will not be allowed to comply with MCL's for Type 1 systems, but Point-of-Entry (POE) devices will be allowed in certain circumstances.
- Blending of water in the distribution system to reduce levels below 10 ppb
- Exemptions or variances as allowed in the Federal Arsenic Rule

New Systems/Sources

- Any new systems and/or sources that begin operation after January 22, 2004, must meet the 10 ppb standard before going on-line.

Initial Monitoring Requirements

- Groundwater Systems will be asked to collect the first compliance sample during the 1st quarter of 2005 from each entry point to the distribution system (EPTDS)

- Surface water systems must sample annually and complete sampling by December 31, 2006

Initial Monitoring Requirements

- If the first quarter sample in 2005 is less than 10 ppb, and there is no other sample result since 1996 showing As over 10 ppb, system will be in compliance and quarterly sampling may stop with DEQ approval.

- Otherwise, continue to sample quarterly in 2005

Compliance Requirements

-Violation based on 4 quarters of monitoring

- Unless a sample will cause the running annual average to exceed the MCL
- All samples collected during any one quarter will be averaged for compliance determination
- Violation if running annual average exceeds MCL

Standby or Emergency Sources

- Not required to install treatment on a well if it is not needed to meet “firm capacity” requirement
- *Firm capacity = the capacity of each water system component with the largest unit taken out of service.*
- True standby or emergency wells will also not be required to install treatment
- Should notify public if any source is being used if levels exceed the MCL

Design Requirements

- Pilot studies are usually required
- Pilots are not needed if proposed treatment units are being used at other systems with similar raw water quality
- Permits are required for ALL installations (including NTNCWS)

Design Requirements

- Items to take into Consideration
  - # and location of wells
  - Technology to be used/pilot data available?
  - Backwash frequencies and volumes
  - Backwash water disposal options
  - Series or parallel installation
  - Maintenance considerations (out of service)
  - Pre-oxidation
  - Iron, sulfate levels
  - Others

Sizing/# of Treatment Units

- For systems with one Entry Point to the Distribution System (EPTDS)

  -The entire capacity of the treatment system must, as a minimum, equal the firm capacity rating of the water system

  -At least two treatment units

  -Preferred method would be to have firm capacity of the treatment system equal to the firm capacity of the water system

Sizing/# of Treatment Units
Example: One EPTDS

- Small water system has two,100 gpm wells in a common well house

- Install in parallel, two (2) 100 gpm treatment units

OR

- Install in parallel, three (3) 50 gpm treatment units

Sizing/# of Treatment Units

- For systems with multiple Entry Points to the Distribution System (EPTDS)

  The firm capacity of the treatment system must equal the firm capacity rating of the water system

  Firm capacity = the capacity of each water system component with the largest unit taken out of service.

Sizing/# of Treatment Units
Example: Multiple EPTDS

- System has fours wells (100, 200, 250 and 300 gpm) all in different well houses. Firm capacity = 550 gpm

- Install treatment units in each well house equal to the well capacity serving that particular well house (i.e. one 100 gpm unit for the 100 gpm well, two 100 gpm units for the 200 gpm well, etc.)

- Treatment capacity in each well house should equal the capacity of the well

Existing Treatment Systems

- Many systems in Michigan were installed to remove iron, but also remove arsenic
- Some have one, large treatment unit to remove both iron and arsenic (aerolators)
- These systems will not be required to build redundant plants until major upgrades/improvements are needed

Point of Entry Requirements

Point of entry devices (on service lines providing treated water for entire building) are allowed under the following conditions:

1. All units must be owned, controlled and maintained by water system owner
2. 100% participation
3. Alarms included
4. ANSI/NSF approved units must be used
5. Operation and Monitoring plans must be approved by state

Operational Requirements

- Operators must have “D” or Limited Treatment licenses
- Collect arsenic samples from the effluent of each treatment unit weekly (via field test kit or certified lab)
- Collect compliance sample quarterly

Types of Treatment

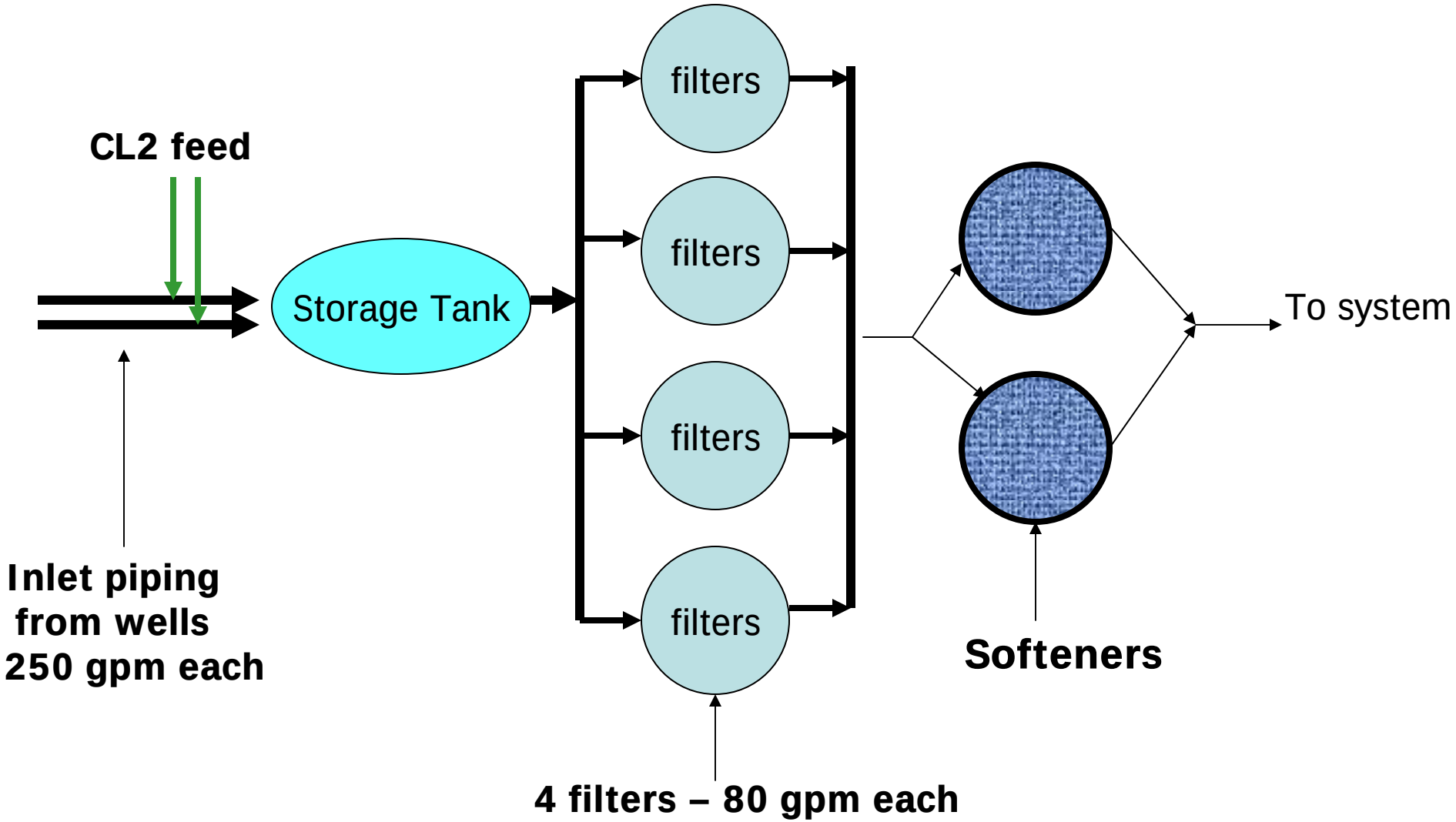
- Severn-Trent SORB 33 media
- ADI- G2 media
- Ad-Edge AD33 media
- Layne – OX media (piloted)
- Ondeo–Ferazur biological process (piloted)
- Conventional oxidation/precip/filtration
- Potassium permanganate/greensand
- Membranes (RO)

Whitmore Lake Apts

Whitmore Lake Apts

1. 125 unit apartment complex
2. Arsenic levels around 20 ppb
3. 2 - 250 gpm wells with hydropnuematic storage
4. 4 - 80 gpm each GFH adsorption media filters
5. Chlorine feed (pre-oxidation)
6. Softening
7. Backwash water to sanitary sewer

Whitmore Lake – Well House



Whitmore Lake Apts

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Questions